

## **Vision of the Institution**

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

## **Mission of the Institution**

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

## **Vision of ECE Department**

In pursuit of world class excellence in the field of Electronics & Communication Engineering by imparting quality education and promoting Research.

## **Mission of ECE Department**

- To empower students with knowledge and competencies in the field of Electronics & Communication Engineering conforming to International standards.
- To produce creative solutions essential to local and global needs in the field of Electronics & Communication Engineering.
- To mould the students professionally with a consciousness of moral values and professional ethical code.

## **Program Educational Objectives (PEOs) of ECE Department**

**PEO1:** To provide world class Education in the principles of engineering that incorporate open ended design experience and the use of software and hardware tools related to Electronics and Communication Engineering and hence improve the employability skills of the student.

**PEO2:** To make the students able to function with multi-disciplinary teams that will enhance the leadership qualities and to formulate and solve engineering problems as a team which helps the student to adopt better professional conduct.

**PEO3:** To provide learning environment that provides open interaction for the students with faculty and staff that makes them innovative and dynamic and encourages research and motivate them to solve the problems of the society.

## Program Outcomes (POs) of ECE Department

### Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSOs) of ECE Department**

1. Will be equipped with knowledge of innovative, dynamic complete design flow specialized in implementation of projects pertaining to communication system, signal processing, digital and analog IC design, embedded systems and will integrate all areas to illustrate the goal of digital India.
2. Will have the ability to analyze, design electronics and communication applications using software tools like, pSpice, XYLINX, MATLAB, Mentor Graphics and other related software's.
3. Can demonstrate the principles of semiconductor devices, digital system, Microprocessor and microcontrollers, signal processing, antenna design in fields of consumer electronics, medical, defence and spacecraft electronics industry.
4. Will have strong ethical moral values and sound fundamental foundation of technical knowledge in all core subjects which help them to explore scientific theories, ideas, methods and technologies that help in solving current and future universal societal problems through Assistive Technology Laboratory as a flat form.

III Year-II Semester

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## MICROPROCESSORS AND MICROCONTROLLERS

### UNIT-I:

**8086 ARCHITECTURE:** Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

### UNIT-II:

**8086 PROGRAMMING:** Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

### UNIT-III:

**8086 INTERFACING:** Semiconductor memories interfacing (RAM, ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED, 7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

### UNIT-IV:

**80386 AND 80486 MICROPROCESSORS:** Introduction, programming concepts, special purpose registers, memory organization, moving to protected mode, virtual mode, memory paging mechanism, architectural differences between 80386 and 80486 microprocessors.

### UNIT-V:

**Intel 8051 MICROCONTROLLER:** Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

Assembly language programming: Instructions, addressing modes, simple programs. Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

### UNIT-VI:

**PIC MICROCONTROLLER:** Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC 16F877.

### Text Books:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSPRao, Tata McGraw Hill Education Private Limited, 3<sup>rd</sup> Edition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning, India Edition.

### References:

1. The Intel Microprocessors - Architecture, Programming, and Interfacing by Barry B. Brey, Pearson, Eighth Edition - 2012.
2. Microprocessors and Microcontrollers - Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
3. Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression 2013

III Year-II Semester

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## MICROWAVE ENGINEERING

### OBJECTIVES

The student will

- Understand fundamental characteristics of waveguides and Microstriplines through electromagnetic field analysis.
- Understand the basic properties of waveguide components and Ferrite materials composition
- Understand the function, design, and integration of the major microwave components oscillators, power amplifier.
- Understand a Microwave test bench setup for measurements.

### UNIT I

**MICROWAVE TRANSMISSION LINES:** Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode. Related Problems.

### UNIT II

**CIRCULAR WAVEGUIDES:** Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes.

Cavity Resonators –

Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients, Excitation techniques – waveguides and cavities, Related Problems.

**MICROSTRIPLINES** – Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

### UNIT III

**MICROWAVE TUBES :** Limitations and Losses of conventional tubes at microwave frequencies. Re-entrant Cavities, Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for  $\rho/p$  Power and Efficiency, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and  $\rho/p$  Characteristics, Electronic and Mechanical Tuning, Applications, Related Problems.

### UNIT-IV

**HELIX TWTs:** Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants (Qualitative treatment).

**M-type Tubes**

Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode,  $\rho/p$  characteristics.

## UNIT V

**WAVEGUIDE COMPONENTS AND APPLICATIONS - I** :Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Scattering Matrix – Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2 Hole, Bethe Hole types, Ferrite Components – Faraday Rotation, S-Matrix Calculations for Gyrotator, Isolator, Circulator, Related Problems.

## UNIT VI

**MICROWAVE SOLID STATE DEVICES**: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics. **MICROWAVE MEASUREMENTS**: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q-factor, Phase shift, VSWR, Impedance Measurement.

## TEXTBOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

## REFERENCES:

1. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004
2. Microwave Engineering - Annapurna Das and Sisir K. Das, McGraw Hill Education, 3<sup>rd</sup> Edition.
3. Microwave and Radar Engineering - M. Kulkarni, Umesh Publications, 3<sup>rd</sup> Edition.
4. Microwave Engineering – GSN Raju, IK International
5. Microwave and Radar Engineering – GS Sasibhushana Rao Pearson

**OUTCOMES**: After going through this course the student will be able to

- Design different modes in waveguide structures
- Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
- Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
- Measure various microwave parameters using a Microwave test bench

III Year-II Semester

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## VLSI DESIGN

### Objectives:

#### The main objectives of this course are:

- Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.

### Syllabus:

#### UNIT-I:

**Introduction and Basic Electrical Properties of MOS Circuits:** Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS.  $I_{ds}$  versus  $V_{ds}$  Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

(TextBook-1)

#### UNIT-II:

**MOS and Bi-CMOS Circuit Design Processes:** MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2 $\mu$ m Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2 $\mu$ m Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

(TextBook-1)

#### UNIT-III:

**Basic Circuit Concepts:** Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

**Scaling of MOS Circuits:** Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

(TextBook-1)

#### **UNIT-IV:**

**Chip Input and Output circuits:** ESD Protection, Input Circuits, Output Circuits and  $L(di/dt)$  Noise, On-Chip clock Generation and Distribution.

**Design for Testability:** Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self Test techniques.

**(TextBook-2)**

#### **UNIT-V:**

**FPGA Design:** FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex8000 FPGA, Altera Flex10K FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

**Introduction to synthesis:** Logic synthesis, RTL synthesis, High level Synthesis.

**(Reference TextBook-1)**

#### **UNIT-VI:**

**Introduction to Low Power VLSI Design:** Introduction to Deep submicron digital IC design, Low Power CMOS Logic Circuits: Over view of power consumption, Low –power design through voltage scaling, Estimation and optimisation of switching activity, Reduction of switching capacitance. Interconnect Design, Power Grid and Clock Design.

**(TextBook-2)**

#### **TextBooks:**

1. Essentials of VLSI Circuits and Systems- Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.

#### **References:**

1. Advanced Digital Design with the Verilog HDL, Michael D. Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3<sup>rd</sup> edition, David Hodges.

#### **Outcomes:**

##### **At the end of this course the student can able to:**

- Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such circumstances as a ratio rules by which circuits can be interconnected in silicon.
- Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
- Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.



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## DIGITAL SIGNAL PROCESSING

### OBJECTIVES

The student will be able to

- Analyze the Discrete Time Signals and Systems
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Know the need of Multirate Processing
- Learn the concepts of DSP Processors

**UNIT I INTRODUCTION:** Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

**UNIT II DISCRETE FOURIER SERIES & FOURIER TRANSFORMS:** Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

**UNIT III DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS:** Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

### UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters.

Basic structures of FIR systems, *Lattice structures, Lattice-ladder structures*

**UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING:** Introduction, Decimation, Interpolation Sampling rate conversion, Implementation of sampling rate converters, *Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks, Trans-multiplexers.*

**UNIT VI INTRODUCTION TO DSP PROCESSORS:** Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On-chip memory, On-chip peripherals.

### **TEXTBOOKS:**

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing– A.V. Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors– Architecture, Programming and Applications, B. Venkataramani, M. Bhaskar, Tata McGraw Hill, 2002
4. Digital Signal Processing– K. Raja Rajeswari, I.K. International Publishing House

### **Reference Books:**

1. Digital Signal Processing: Andreas Antoniou, Tata McGraw Hill, 2006
2. Digital Signal Processing: M.H. Hayes, Schaum's Outlines, Tata McGraw Hill, 2007.
3. DSP Primer– C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab– Robert J. Schilling, Sandra L. Harris, Thomson, 2007.
5. Digital Signal Processing– Alan V. Oppenheim, Ronald W. Schaffer, PHI Ed., 2006
6. Digital Signal Processing– Ramesh Babu, Sci Tech Publications

### **OUTCOMES**

After going through this course the student will be able to

- Apply the difference equations concept in the analysis of discrete time systems
- Use the FFT algorithm for solving the DFT of a given signal
- Design a digital filter (FIR & IIR) from the given specifications
- Realize the FIR and IIR structures from the designed digital filter.
- Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems...)
- Apply the signal processing concepts on DSP Processor.

**BIO-MEDICAL  
ENGINEERING (OPEN ELECTIVE)**

**UNIT-I:**

**INTRODUCTION TO BIOMEDICAL INSTRUMENTATION:** Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Evoked Responses.

**UNIT-II:**

**ELECTRODES AND TRANSDUCERS:** Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

**UNIT-III:**

**CARDIOVASCULAR SYSTEM AND MEASUREMENTS:** The Heart and Cardiovascular System, Electrocardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

**MEASUREMENTS IN THE RESPIRATORY SYSTEM:** The Physiology of the Respiratory System, Tests and Instrumentation for the Mechanics of Breathing, Respiratory Therapy Equipment.

**UNIT-IV:**

**PATIENT CARE AND MONITORING:** Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic Use.

**THERAPEUTIC AND PROSTHETIC DEVICES:** Audiometers and Hearing Aids, Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision, Electrophysiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement, Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

**UNIT-V:**

**DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY:** Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

## **UNIT-VI:**

**MONITORS, RECORDERS AND SHOCK HAZARDS:** Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

### **Text Books:**

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell, Wiebell, Pfeiffer

### **References:**

1. "Introduction to Bio-Medical Equipment Technology", 4<sup>th</sup> Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGraw Hill

III Year-II Semester

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## MICROPROCESSORS AND MICROCONTROLLERS LAB

### LIST OF EXPERIMENTS

#### **PART-A: (Minimum of 5 Experiments has to be performed)**

##### **8086 Assembly Language Programming using Assembler Directives**

15. Sorting.
16. Multi-byte addition/subtraction
17. Sum of squares/cubes of given numbers
18. Addition of n-BCD numbers
19. Factorial of given numbers
20. Multiplication and Division operations
21. Stack operations
22. BCD to 7-segment display codes

#### **PART-B: (Minimum of 3 Experiments has to be performed) 8086 Interfacing**

1. Hardware/Software Interrupt Application
2. A/D Interfacing through Intel 8255
3. D/A Interfacing through Intel 8255
4. Keyboard and Display Interfacing through Intel 8279
5. Generation of waveforms using Intel 8253/8254

#### **PART-C: (Minimum of 3 Experiments has to be performed) 8051 Assembly Language Programs**

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Addition of even numbers from a given array
3. Ascending/Descending order
4. Average of n-numbers

#### **PART-D: (Minimum of 3 Experiments has to be performed) 8051 Interfacing**

1. Switches and LEDs
2. 7-Segment display (multiplexed)
3. Stepper Motor Interface
4. Traffic Light Controller

**EquipmentRequired:**

1. RegulatedPowersupplies
2. Analog/DigitalStorageOscilloscopes
3. 8086Microprocessorkits
4. 8051microcontrollerkits
5. ADCmodule
6. DACmodule
7. Steppermotormodule
8. Keyboardmodule
9. LED,7-SegemtUnits
10. DigitalMultimeters
11. ROM/RAMInterfacemodule
12. BreadBoard etc.

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### VLSI LABORATORY

**Note:** The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

#### **List of Experiments:**

- i. Design and Implementation of an Universal Gates
- ii. Design and Implementation of an Inverter
- iii. Design and Implementation of Full Adder
- iv. Design and Implementation of Full Subtractor
- v. Design and Implementation of Decoder
- vi. Design and Implementation of RS-Latch
- vii. Design and Implementation of D-Latch
- viii. Design and Implementation as a synchronous counter
- ix. Design and Implementation of static RAM cell
- x. Design and Implementation of 8bit DAC using R-2R ladder network

#### **Software Required:**

- i. Mentor Graphics Software/Equivalent Industry Standard Software.
- ii. Personal computer system with necessary software to run the programs and to implement.

## III Year-II Semester

### **DIGITAL COMMUNICATIONS LAB**

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code-Encoder and Decoder
12. Convolution Code-Encoder and Decoder

#### **Equipment required for Laboratories:**

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 MHz
4. RF Generators – 0 – 1000 MHz./0 – 100M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components